EV549911730

PTO/SB/17 (12-04)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Effective on 12/08/2004.
Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL
For FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT	($) 500.00

Complete if Known	
Application Number	09/676,552
Filing Date	9/30/2000
First Named Inventor	Michael Ginsberg
Examiner Name	NILESH R SHAH
Art Unit	2127
Attorney Docket No.	MS1 859US

METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☑ Deposit Account Deposit Account Number: 12-0769 Deposit Account Name: Lee & Hayes, PLLC

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☑ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the filing fee**

☑ Charge any additional fee(s) or underpayments of fee(s) under 37 CFR 1.16 and 1.17 ☑ Credit any overpayments

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fees Paid ($)
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 or, for Reissues, each claim over 20 and more than in the original patent	50	25
Each independent claim over 3 or, for Reissues, each independent claim more than in the original patent	200	100
Multiple dependent claims	360	180

Total Claims	Extra Claims	Fee ($)	Fee Paid ($)
_____ - 20 or HP =	_____	x 50	= _____

HP = highest number of total claims paid for, if greater than 20

Indep. Claims	Extra Claims	Fee ($)	Fee Paid ($)
_____ - 3 or HP =	_____	x 200	= _____

HP = highest number of independent claims paid for, if greater than 3

Multiple Dependent Claims	
Fee ($)	Fee Paid ($)
_____	_____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee ($)	Fee Paid ($)
_____ - 100 =	_____	/ 50 = _____ (round **up** to a whole number)	x _____	= _____

4. OTHER FEE(S)

	Fees Paid ($)
Non-English Specification, $130 fee (no small entity discount)	
Other: Appeal Brief	500.00

SUBMITTED BY

Signature		Registration No. (Attorney/Agent) 40480	Telephone (509) 324-9256
Name (Print/Type)	Rocco L. Adornato		Date 05/12/2005

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No. 09/676,552
Filing Date 09/30/2000
Inventorship ..... Michael Ginsberg
Applicant ..... Microsoft Corporation
Group Art Unit 2127
Examiner ..... Shah, Nilesh R.
Attorney's Docket No. MS1-859US
Title: Data Structure For Efficient Enqueuing And Dequeuing

APPEAL BRIEF

To: Commissioner of Patents and Trademarks
P.O. Box 1450
Alexandria, VA 22313-1450

From: Rocco L. Adornato (Tel. 509-324-9256, x257; Fax 509-323-8979)
Customer No. 22801

Applicant submits this Appeal Brief for consideration by the Board of Patent Appeals and Interferences. A Notice of Appeal was filed in this case on 3 February 2005. This Appeal Brief is believed timely filed on or before 3 May 2005, with a one-month extension of time and related fee, enclosed herewith.

Favorable action on this appeal is requested at the earliest convenience of the Board.

This Appeal Brief is believed to comply with the requirements stated in 37 CFR § 1.192, and the headings used herein are chosen to comply with § 1.192.

Real Party in Interest

The real party in interest for purposes of this appeal is Microsoft Corporation.

Related Appeals and Interferences

There are no appeals or interferences related to the instant appeal.

Status of Claims

Claims 1-22 were originally filed with the instant application, and all of claims 1-22 remain pending at the time of the instant appeal.

Claims 1-22 stand rejected as stated in the Final Official Action dated 3 September 2004. Applicant appeals from the rejection of claims 1-22.

Status of Amendments

Applicant filed a Response after Final Rejection on or about 3 November 2004, but did not amend any claims in that response. Claims 1-22 have not been amended since filing.

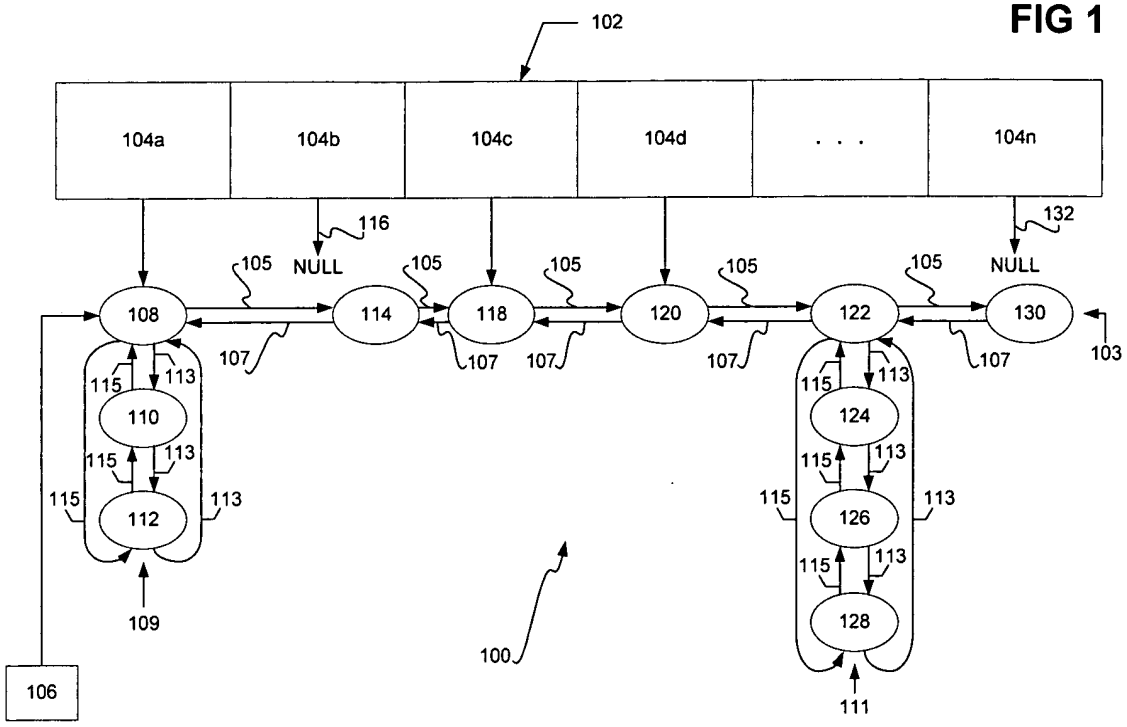
Summary of Invention

The application relates to a data structure for efficiently ordering a number of ranked entities, including linking a new entity to and delinking an entity from the ranked entities. More particularly, the application relates to enqueuing prioritized threads to and dequeuing prioritized threads from a priority queue. A data structure in one embodiment includes a horizontally linked list, an array of a number of array entries, one or more vertically linked lists, and a head pointer. The ranks of the entities are distributed over the array, such that each array entry has a corresponding range of ranks.

Figure 1 of the disclosure illustrates a non-limiting implementation of a data structure **100** for efficiently ordering a number of ranked entities. The ranked entities can include, for example, the entities **108**, **110**, **112**, **114**, **118**, **120**, **122**, **124**, **126**, **128**, and **130** (collectively, "entities **108-130**") shown in Figure 1. Applicant describes this data structure in the specification at least at page 4, line 6 through page 6, line 13.

For convenience, Figure 1 is reproduced below:

FIG 1



The data structure **100** of Figure 1 includes a horizontally linked list (e.g., **103**), an array (e.g., **102**) of a number of array entries (e.g., **104a**, **104b**, **104c**, **104d**, and **104n**; collectively **104**), one or more vertically linked lists (e.g., **109** and **111**), and a head pointer (e.g., **106**).

The ranks of the entities **108-130** are distributed over the array **102**, such that each of the array entries **104** has a corresponding range of ranks. Each array entry **104** points either to null (e.g., entries **104b** and **104n**), or to the entity having the greatest rank within that array entry's range of ranks (e.g., entry **104a**).

The horizontally linked list **103** links at least a subset of the ranked entities **108-130** in a descending rank order direction, as indicated by the arrows **105**, and

optionally in an ascending rank order direction, as indicated by the arrows **107**. Each of the entities **108-130** in the horizontally linked list **103** has a unique rank as compared to the ranks of the other entities **108-130** in the horizontally linked list **103**. Each vertically linked list (e.g., **109** or **111**) links a respective subset of the entities **108-130** that has an identical rank in a first vertical direction, as indicated by the arrows **113**, and optionally in a second vertical direction, as indicated by the arrows **115**. The head pointer **106** points to the entity (e.g., **108**) that has the greatest rank.

Figure 2 illustrates a process **200** for delinking a particular entity from the ranked entities, and Figure 3 illustrates a data structure **100'** from which the particular entity (e.g., **108**) has been removed, with the data structure **100** shown in Figure 1 as a starting point. Applicant describes Figures 2 and 3 in the specification from page 6, line 14 through page 10, line 18.

Figure 4 illustrates a process **400** for linking new entities into the data structure, and Figure 5 illustrates a data structure **100''** to which the new entities (e.g., **513**, **515**, or **517**) are linked, with the data structure **100** shown in Figure 1 as a starting point. Applicant describes Figure 4 in the specification from page 10, line 19 through page 13, line 12, and describes Figure 5 in the specification from page 13, line 13 through page 14, line 14.

Issue

Whether claims 1-22 are unpatentable under 35 U.S.C. § 103(a) over Nolan in view of Glover?

Grouping of Claims

For the purposes of this appeal, the Applicant groups the pending claims 1-22 as follows:

Group I: Claims 1-9, 11-13, and 19-22, all of which stand or fall together for purposes of this appeal; and

Group II: Claims 10 and 14-18, all of which stand or fall together.

These two groups are addressed separately in the Argument below.

Argument

As stated on page 2 of the Final Official Action mailed on 3 September 2004 (hereinafter, the "Final Action"), claims 1-22 stand rejected as being unpatentable under 35 U.S.C. § 103(a) over United States Patent No. 4,896,261 to Nolan (hereinafter "Nolan") in view of United States Patent No. 5,379,297 to Glover, et al. (hereinafter "Glover").

The Applicant respectfully traverses these rejections, and addresses the Group I claims and the Group II claims separately below.

Group I Claims

Turning first to **independent claim 1** and all claims depending therefrom, claim 1 defines a data structure stored on a machine-readable medium. The data structure efficiently orders a plurality of entities. Each entity has a rank within a plurality of ranks. The data structure includes a horizontally linked list linking at least some of the entities in order of descending rank. Each entity in the horizontally linked list has a unique rank as compared to the ranks of other entities in the horizontally linked list. The data structure also includes an array that contains array entries. The ranks are distributed among the array entries, so that each array entry is associated with a corresponding range of ranks. Within the array, a given array entry points to an entity in the linked list that has the greatest rank within the range of ranks assigned to that given array entry.

For convenience, a portion of claim 1 is reproduced here, with certain features that will be discussed in detail below being underlined for emphasis:

> "an array having a plurality of array entries over which the plurality of ranks are distributed such that each array entry has a corresponding range of ranks, at least one array entry each pointing

to an entity of the plurality of entities having a greatest rank within the corresponding range of ranks for the array entry."

Paragraph 4 of the Final Action, on pages 2-3 thereof, rejected claim 1 under § 103(a) as being unpatentable over Nolan in view of Glover. Applicant respectfully traverses the rejections of claim 1 and all claims depending therefrom. Nolan, the primary reference, is discussed first. Glover, the secondary reference, is discussed afterwards.

For convenience, the rejection of claim 1 as stated in the Final Action, is reproduced here, particularly the portion referring to Nolan:

> 4. As per claim 1, Nolan teaches a machine-readable medium having a data structure stored thereon for efficiently ordering a plurality of entities, each entity having a rank within a plurality of ranks, the data structure comprising (Fig 2, col. 2 lines 22-45):
>
> an array having a plurality of array entries over which the plurality of ranks are distributed such that each array entry has a corresponding range of ranks, at least one array entry each pointing to an entity of the plurality of entities having a greatest rank within the corresponding range of ranks for the array entry (col. 9 lines 29-40, col. 11 lines 12-20). Nolan does not specifically teach the use of a horizontally linked list.

Thus, the Final Action cited column 9, lines 29-40, and column 11, lines 12-20 of Nolan against the "array" feature reproduced above from the Applicant's claim 1. Each of these portions of Nolan is addressed separately below.

1. The message insertion scheme described by Nolan neither teaches nor suggests an "array entry [having] a corresponding range of ranks".

For convenience, the cited Nolan excerpt of column 9, lines 29-40, is reproduced below:

> "If the new message does not have a priority higher than the message associated with the message block addressed by the link pointer, then control passes to a process block 66 which essentially sets the link pointer to the next subsequent block address per the message list 28, and control returns to the decision block 58. Thus, the flowchart 50 blocks 65 and 66 result in an effective comparison of the priority of the new message with the priorities of all of the messages awaiting transmission. Unless the new message has a higher priority than any of the messages awaiting transmission, it will be inserted at the end of the message list 28 per blocks 59-63."

This portion of Nolan appears to discuss traversing an existing message list 28 to determine where to insert a new message, by comparing the priority of the new message to the priority of each message already in the existing message list. Each message in the list is assigned a given priority as to all other messages in the list.

To place the above excerpt from Nolan in context, Nolan's Abstract describes a "system (10) for scheduling serial message transmission on a single

bus (11) having a plurality of messages to be sent stored in memory (21) with each message located between associated start and end message addresses (START, END)." Nolan's column 3, lines 12-14 provides as follows: "Referring to Fig. 1, a schematic diagram of a system 10 of scheduling serial message transmission on a single bus 11 is illustrated."

Finally, Nolan's Figure 1 is copied on the next page for convenience:

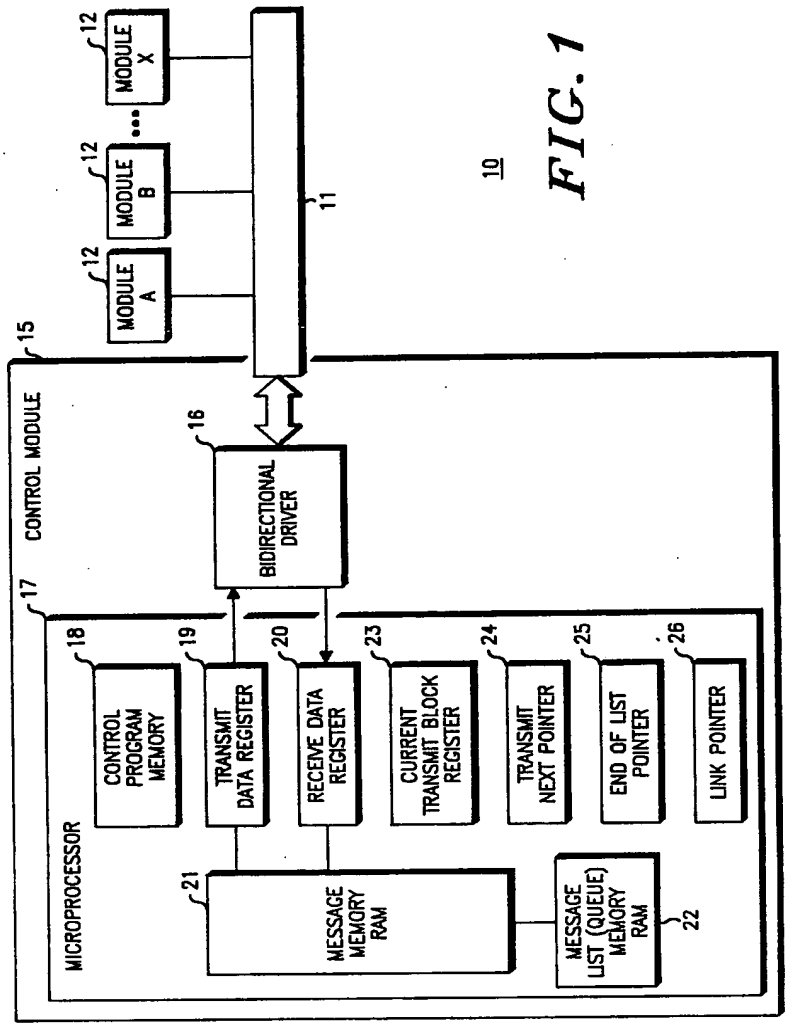


FIG. 1

Nolan thus appears to teach a given message having a given priority within Nolan's priority-based transmission scheme. In contrast to Nolan's approach of

assigning each message a given priority, the Applicant's claim 1 recites "each array entry [having] a corresponding range of ranks". The above excerpt from Nolan neither teaches nor suggests a given one of the messages having a "range" of priorities. In Nolan's scheme, if a given message were assigned a "range" of priorities, then the ranges of priorities assigned to two or more different Nolan messages could overlap. Thus, these two or more messages might be viewed as having equal priority when contending for access to Nolan's single bus 11 for transmission. This contention scenario could result in the Nolan system deadlocking, with the two "equal" messages contending indefinitely. However, it appears that Nolan addresses this issue by defining each message with one (and only one) priority level. While Nolan may discuss reprioritizing messages (see, e.g., Nolan, column 1, line 36; column 10, line 30-35; column 11, lines 20-25), Nolan neither teaches nor suggests a particular message having a "range" of priorities. Therefore, the column 9 portion of Nolan cited in the Final Action neither teaches nor suggests a message having a "range of ranks", as recited in the Applicant's claim 1.

The column 11 portion of Nolan, which was also cited in the Final Action to support the § 103 rejection of claim 1, is now discussed.

2. *Nolan's scheme for locating a given message ID (MID) among existing messages neither teaches nor suggests an "array entry [having] a corresponding range of ranks".*

The cited portion of Nolan, column 11, lines 12-20, is reproduced for convenience below:

> "After process block 85, control passes to a decision block 86 which effectively compares the message ID (MID) of the message associated with the pointer block address in the link pointer to the MID corresponding to the repeat message MID. If a match is obtained, then the message pointer block corresponding to the message to be resent has been found. If so, control passes to a process block 87 which essentially will delink this message pointer block, corresponding to the link pointer block, from the message list 28."

This portion of Nolan appears to discuss traversing messages to find an existing message whose message ID (MID) matches a "repeat message MID", and appears to describe part of a process for resending messages that were not sent successfully before. However, Nolan's MIDs are unique. For example, Nolan's Abstract references "the message unique ID code (MID)" (emphasis added). Further, Nolan's column 10, line 58, provides as follows, with emphasis added:

> "In either event, the essential feature is that something signals the microprocessor 17 to resend a specific message identified by its unique message ID code (MID)."

Nolan's scheme as described in column 11 does not teach or suggest a data structure wherein "each array entry has a corresponding range of ranks", as recited by the Applicant in claim 1. On at least this further basis, Nolan does not support a § 103 rejection of the portion of claim 1 reproduced and emphasized above.

3. The assertions in the Advisory Action do not overcome the shortcomings of the rejections stated in the Final Action.

Turning now to the Advisory Action mailed by the Office on 2 December 2004 (hereinafter the "Advisory Action"), the Continuation Sheet thereof is reproduced below for convenience:

> Continuation of 5. does NOT place the application in condition for allowance because: Nolan teaches the use of plurality of entries with a range of different ranks (note Priority byte col. 5 lines 16-22). Nolan teaches the use of more than one message (col. 5, lines 50-55). Nolan continues to teaches the use of a message list (col. 5 lines 30-40). Glover teaches the use of a horizontal channel queue (col. 50 lines 62-65). Further Glover teaches the use of priority (col. 57 lines 25-33, col. 13 lines 20-26.

Thus, the Advisory Action states that Nolan teaches the use of a "plurality of entries with a range of different ranks", and cites the "priority byte" discussed at column 5, lines 16-22 of Nolan. For convenience, the cited portion of Nolan, column 5, lines 16-22, is reproduced below:

> "In addition, each pointer block 27 associated with a message includes a priority byte (PRI) associated with that message and a count byte (CNT) associated with the number of times that transmission of that message had been attempted."

First, the Applicant emphasizes the difference between "a *plurality of entries* with a range of different ranks", as stated in the Advisory Action, and "*each array entry* [having] a corresponding range of ranks", as actually recited in the Applicant's claim 1. The Applicant asserts that the Advisory Action has misstated the Applicant's claim language, and thus any comments in the Advisory Action based on this misstatement are inapposite.

Turning next to Nolan's "priority byte", as discussed above, Nolan appears to describe a priority-based transmission scheme wherein each message is assigned a given priority for transmission. However, each Nolan message is assigned only one priority, not a "range" of priorities. For these reasons, Nolan neither teaches nor suggests that a given message pointer block 27 has a priority byte PRI that specifies a "range" of priorities. Instead, as discussed above, Nolan's priority-based transmission scheme relies on each message pointer block having one (and only one) priority level.

While the priority level of a given message may change should it need to be retransmitted, each given Nolan message is not assigned a "range" of priorities or "ranks". If ones of Nolan's messages were assigned a "range" of priorities, resource contention and deadlock could result, as discussed above. For at least these reasons, the Office's statements in the Advisory Action fail to address the shortcomings of the rejections previously stated in the Final Action.

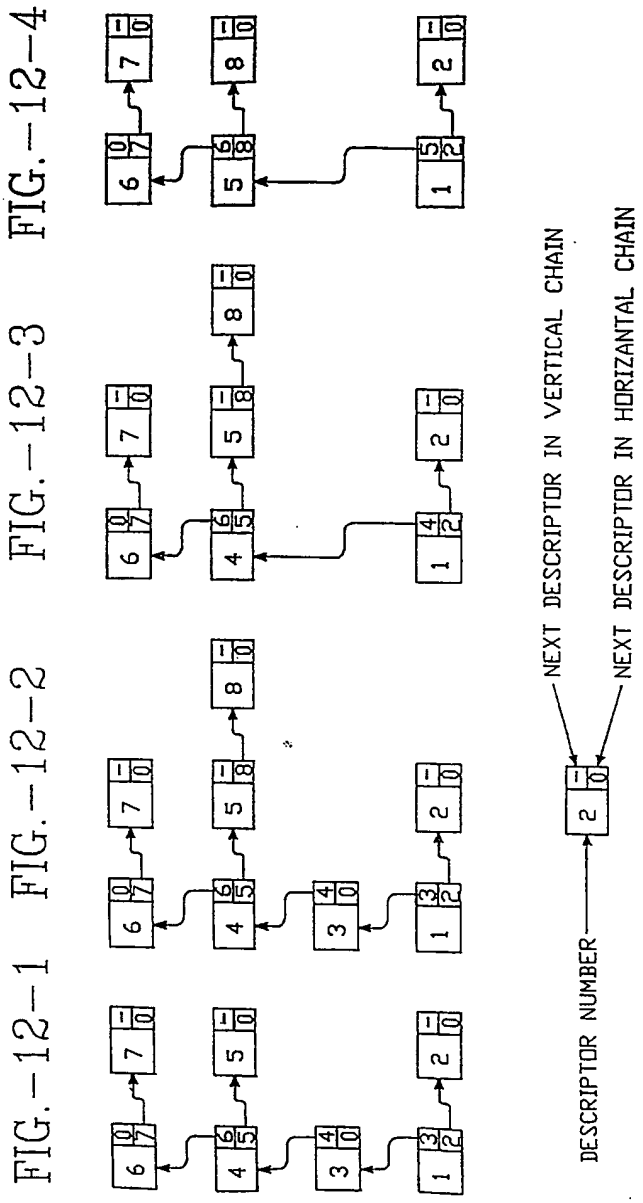
In light of the foregoing comments, Nolan clearly does not teach or suggest the Applicant's feature of "each array entry [having] a corresponding range of ranks", as recited in claim 1.

Turning now to the secondary § 103 reference, Glover, the portion of the rejection of claim 1 that refers to Glover is reproduced below for convenience:

> Glover teaches a horizontally linked list linking at least a subset of the plurality of entities in at least a descending rank order direction, each entity in the horizontally linked list having a unique rank as compared to the ranks of other entities in the horizontally linked list (Fig 12-1, 12, 2, 12-3, 12-4, col. 6 lines 57-67, col. 49 line 59 –col. 50 line 13). It would have been obvious to one skilled in the art at the time of the invention to combine the teachings or Glover and Nolan to ensure horizontal linked list have a unique rank. By having a unique horizontal linked list rank each list can be controlled and identified by the user to provide an more efficient system.

Applicant agrees with the Office's assessment that Nolan does not specifically teach the use of a horizontally linked list. Thus, the Office cited Glover for this teaching, particularly: Figures 12-1 through 12-4; column 6, lines 57-67; and column 49, line 59 through column 50, line 13.

For convenience, Glover's Figures 12-1 through 12-4, which the Final Action cited against claim 1, are reproduced below:



For further convenience, Glover's column 6, lines 57-67, which the Final Action cited against claim 1 is reproduced below:

"A plurality of rate queues are [sic] provided, one for each transmission rate. Each rate queue is a linked list of descriptors, each descriptor in the rate queue identifies a packet from a different one of the channels having cells to be transmitted at the rate for the particular rate queue. The linked list of descriptors for the rate queue identifies a different packet for each of the channels having a cell to be transmitted at the rate for the particular rate queue."

Finally, column 49, line 59 through column 50, line 13, of Glover is reproduced below:

"Referring to FIG. 12-1 each of the rectangles represensts [sic] a descriptor, X, and includes two pointers, a vertical pointer, v, and a horizontal pointer, h. Additionally, each descriptor includes other control information asscociated [sic] with a packet including for example, a length field, l, indicating the number of bits (or cells) in the packet. In the packet descriptor, X indicates the identity of the particular packet being processed by the queue of FIG. 10. For each descriptor, X, an associated rate queue pointer, v, identifies the next-in-order descriptor in the rate queue (vertical chain) that forms a linked list of packets having the same transmission rate. In FIG. 12-1, Descriptor6 (X=6) is at the tail of the rate queue since the next-in-order vertical packet is Descriptor0, that is v=0 for Descriptor6. Descriptorl is at the head of the linked list. Descriptorl has a vertical pointer 3 pointing to the next-in-order packet 3. Descriptor3 has a pointer 4 (v=4) which points to Descriptor4. Descriptor4 has a pointer 6 which points to the tail of the queue Descriptor6. The rate queue in the vertical direction includes Descriptorl, Descriptor3, Descriptor4 and Descriptor6."

The data structure shown in Glover's Figures 12-1 through 12-4 and described in Glover's columns 6, 49, and 50 includes a plurality of nodes. Each node includes a respective descriptor. For example, Figure 12-1 shows a set of nodes having descriptors that range from 1-7. The Applicant notes that within each one of Glover's Figures 12-1 through 12-4, each descriptor is unique and identifies each node uniquely. Generalizing from Glover's Figures 12-1 through 12-4, Glover appears to assign a unique descriptor to each of the nodes in its data structure.

Glover's Figures 12-1 through 12-4 also include what appear to be two sets of pointers. A first set of pointers points to a first "next node", and a second set of pointers points to a second "next node". Logically, this pointer structure would appear to assume that each node is assigned a unique descriptor number. Further, each of Glover's pointers points to at most one other node, or points to null.

In contrast to the foregoing teaching from Glover, the Applicant's claim 1 recites "each array entry [having] a corresponding range of ranks". None of Glover's nodes as shown in Figures 12-1 through 12-4 have a "range" of descriptors or other "ranks" associated therewith. Instead, each node in Glover's data structure has a unique rank within that data structure, as indicated by its unique descriptor. Therefore, Glover's unique descriptor for each node neither teaches nor suggests an "array entry [having] a corresponding range of ranks".

Turning to Glover's pointer structure as shown in Glover's Figures 12-1 through 12-4, while some nodes in Glover's data structure may be associated with multiple pointers, these pointers do not establish a "range of ranks" for any given node. For example, turning to Figure 12-1, node "4" is pointed-to by node "3", and node "4" points to nodes "5" and "6". Glover's pointer structure does not establish a "range of ranks" associated with node "4". To the extent that node "4" has "rank", it occupies a single rank "below" node "3" and above nodes "5" and "6". However, Glover's pointer structure does not assign a "range" of ranks to node "4", or to any other node shown in Glover's Figures 12-1 through 12-4. On at least this basis, Glover does not support a § 103 rejection of claim 1.

Turning back to the Advisory Action, the Continuation Sheet thereof is once again reproduced for convenience:

> Continuation of 5. does NOT place the application in condition for allowance because: Nolan teaches the use of plurality of entries with a range of different ranks (note Priority byte col. 5 lines 16-22). Nolan teaches the use of more than one message (col. 5, lines 50-55). Nolan continues to teaches the use of a message list (col. 5 lines 30-40). Glover teaches the use of a horizontal channel queue (col. 50 lines 62-65). Further Glover teaches the use of priority (col. 57 lines 25-33, col. 13 lines 20-26.

The Office's citation of Glover' use of a "horizontal channel queue" appears irrelevant to the Applicant's recitation of an "array entry [having] a corresponding range of ranks". However, the Advisory Action further states that "Glover teaches the use of priority", and cites Glover's column 57, lines 25-33,

and column 13, lines 20-26. For convenience, column 57, lines 25-33 of Glover is reproduced below (with emphasis added):

> "26. The communication system of claim 25 wherein said selector means grants priority to cells from the return path whereby congestion signals are given priority in the network.
>
> 27. The communication system of claim 23 wherein said forward paths include queues for storing cells in the forward direction, each of said queues including means for providing a queue-level signal, as a function of the fullness of the queue, to form the congestion signal."

For further convenience, column 13, lines 20-26 from Glover is reproduced below (with emphasis added):

> "The translator 51 for each cell translates the value of the incoming virtual channel identifier (VCI) for the cell to an outgoing VCI for the cell, directs the cell to an outgoing link, and marks the priority of the cell. For example, the translator is implemented as a table storing values where the table is addressed by the incoming VCI."

While the above excerpts of Glover may deal generally with priorities assigned to cells, these portions of Glover fail to teach or suggest an "array entry [having] a corresponding range of ranks", as recited in Applicant's claim 1.

In light of the foregoing comments, Glover neither teaches nor suggests an element having a "range of ranks", as recited in Applicant's claim 1. Therefore, these cited portions of Glover fail to provide the teaching or suggestion missing from Nolan that is necessary to state a *prima facie* case of obviousness under § 103.

For at least the foregoing reasons, the rejections of claims 1-9 fail to state a *prima facie* case of obviousness under § 103. Similarly, Nolan and Glover fail to support a § 103 rejection of these claims because Nolan and Glover do not teach or suggest every limitation recited in claim 1, as required by MPEP § 2142. On at least this basis, the Applicant requests reconsideration and withdrawal of the § 103 rejections of claims 1-9.

Claim 11 depends from independent claim 10, which is addressed in the Argument directed to the Group II claims below. Dependent claim 11 recites, in part, an "array entry [having] a corresponding range of ranks", which is similar to the feature emphasized and discussed above in connection with claim 1. Thus, the above comments directed to claim 1 and to the Nolan and Glover references apply equally to claim 11 and claims 12-13 depending ultimately therefrom.

On at least this basis, the rejections of claims 11-13 fail to state a *prima facie* case of obviousness under § 103 because Nolan and Glover fail to teach or suggest all limitations recited in claim 11, as required by MPEP § 2142. Applicant

thus requests reconsideration and withdrawal of the § 103 rejections of claims 11-13.

Independent claim 19 is reproduced in part here for convenience, with pertinent portions emphasized for ease of reference and discussion below:

> "A method for adding a new entity having a rank within a plurality of ranks to a plurality of entities also each having a rank within the plurality of ranks, the method comprising:
>
> of a plurality of array entries of an array over which the plurality of ranks are distributed such that each array entry has a corresponding range of ranks, determining the array entry having the corresponding range of ranks in which the rank of the new entity lies;
>
> adjusting the array entry having the corresponding range of ranks into which the rank of the new entity lies to point to the new entity in response to determining that the array entry currently points to null;
>
> adjusting the array entry having the corresponding range of ranks into which the rank of the new entity lies to point to the new entity in response to determining that the array entry current points to an entity having a rank less than the rank of the new entity; ...".

The emphasized portions of claim 19 are similar to the features of claim 1 discussed above. Thus, the above comments directed to claim 1 and to the Nolan and Glover references apply equally to claim 19 and claims 20-22 depending therefrom.

On at least this basis, the rejections of claims 19-22 fail to state a *prima facie* case of obviousness under § 103 because Nolan and Glover fail to teach or suggest all limitations recited in claim 19, as required by MPEP § 2142. Applicant thus requests reconsideration and withdrawal of the § 103 rejections of claims 19-22.

Group II Claims

The Group II claims include **independent claim 10** and claims 14-18 depending ultimately therefrom. The Group II claims stand rejected under § 103 as being unpatentable over Nolan in view of Glover. The Applicant traverses this rejection, for the reasons set forth below.

Independent claim 10 defines a method for removing a particular entity from a plurality of entities, with each entity having a rank within a plurality of ranks. The method includes delinking the particular entity from a vertically linked list to which the particular entity may be linked, delinking the particular entity from a horizontally linked list to which the particular entity may be linked, and

adjusting an array entry pointing to the particular entity to point either to null or to another entity.

A part of independent claim 10 is reproduced here for convenience, with portions emphasized for ease of reference and discussion below:

> "10. A method for removing a particular entity from a plurality of entities, each entity having a rank within a plurality of ranks, the method comprising:
>
> in response to determining that the particular entity is present within a vertically linked list linking in at least one direction a corresponding subset of the plurality of entities having an identical rank, the corresponding subset including the particular entity, delinking the particular entity from the vertically linked list; ..."

Page 5 of the Final Action stated the § 103 rejection of the above portion of claim 10, and that rejection is reproduced here for convenience:

> 13. As per claim 10, Nolan teaches a method for removing a particular entity from a plurality of entities, each entity having a rank within a plurality of ranks, the method comprising: in response to determining that the particular entity is present within a vertically linked list linking in at least one direction a corresponding subset of the plurality of entities having an identical rank, the corresponding subset including the particular entity(col. 9 lines 29-40, col. 11 lines 12-20).

Thus, the Final Action cited column 9, lines 29-40 and column 11, lines 12-20 of Nolan against the portion of claim 10 reproduced and emphasized above. The Final Action cited the same portions of Nolan against claim 1, and the Applicant addressed Nolan above. These comments apply similarly to claim 10, but for convenience are presented here as well. For convenience, the column 9 and column 11 portions of Nolan are discussed separately.

First, column 9, lines 29-40 of Nolan is reproduced below:

> "If the new message does not have a priority higher than the message associated with the message block addressed by the link pointer, then control passes to a process block 66 which essentially sets the link pointer to the next subsequent block address per the message list 28, and control returns to the decision block 58. Thus, the flowchart 50 blocks 65 and 66 result in an effective comparison of the priority of the new message with the priorities of all of the messages awaiting transmission. Unless the new message has a higher priority than any of the messages awaiting transmission, it will be inserted at the end of the message list 28 per blocks 59-63."

The Applicant discussed the above portion of Nolan in connection with claim 1, in the Group I set of claims. Summarizing this previous discussion, this portion of Nolan appears to describe a priority-based scheme in which a new message is inserted in a message list 28 based on its priority relative to the priorities of the messages already in the message list 28. However, it appears that

each of the existing messages in the message list 28, as well as the new message being inserted therein, is assigned a respective unique priority. Since Nolan's above teaching appears in the context of a priority-based scheme for arbitrating access to a single bus for transmitting the messages, each Nolan message must be assigned a unique priority; otherwise, multiple messages could have the same effective priority and could contend for access to the single bus indefinitely, thereby deadlocking the Nolan system.

In contrast to column 9 of Nolan, the Applicant's claim 10 recites, in part, "in response to determining that the particular entity is present within a vertically linked list linking in at least one direction a corresponding subset of the plurality of entities having an identical rank". Column 9 of Nolan fails to teach or suggest a "plurality of entities having an identical rank", because, as discussed above, if multiple Nolan messages were assigned identical priorities, Nolan's system could deadlock. Therefore, on at least this basis, the column 9 portion of Nolan fails to teach or suggest the above feature recited in the Applicant's claim 10, and this portion of Nolan does not support a § 103 rejection of Applicant's claim 10.

Turning to the other portion of Nolan cited against claim 10, the Applicant reproduces Nolan, column 11, lines 12-20, as follows:

> "After process block 85, control passes to a decision block 86 which effectively compares the message ID (MID) of the message associated with the pointer block

address in the link pointer to the MID corresponding to the repeat message MID. If a match is obtained, then the message pointer block corresponding to the message to be resent has been found. If so, control passes to a process block 87 which essentially will delink this message pointer block, corresponding to the link pointer block, from the message list 28."

The Applicant also discussed this portion of Nolan above in connection with claim 1. Summarizing the Applicant's previous discussion, Nolan discloses messages having unique MIDs, and the column 11 portion of Nolan appears to describe a scheme for processing messages for re-transmission after failure of an initial transmission attempt. In that context, the above portion of Nolan appears to describe traversing a store of existing messages to determine which of these messages has an MID that matches the MID of a given "repeat message MID". Not only does Nolan expressly teach that each MID is unique, as established in the Applicant's discussion directed above to claim 1, Nolan's traversal and comparison process as taught in column 11 logically requires that each MID be unique. If multiple Nolan messages had the same MID, then duplicate entries could exist in the store of existing messages, and the traversal process would not know which of these duplicate MIDs to "delink".

In contrast to column 11 of Nolan, the Applicant's claim 10 recites, in part, "in response to determining that the particular entity is present within a vertically linked list linking in at least one direction a corresponding subset of the plurality

of entities having an identical rank". Column 11 of Nolan fails to teach or suggest a "plurality of entities having an identical rank". On at least this basis, the column 11 portion of Nolan fails to teach or suggest the above feature recited in the Applicant's claim 10, and this portion of Nolan does not support a § 103 rejection of Applicant's claim 10.

In light of the foregoing comments, Nolan neither teaches nor suggests the Applicant's feature of "in response to determining that the particular entity is present within a vertically linked list linking in at least one direction a corresponding subset of the plurality of entities having an identical rank," as recited in claim 10.

Turning now to the secondary reference cited against claim 10, Glover, the Applicant agrees with the Office's assessment that Nolan does not specifically teach the use of a horizontally/vertically linked list, as stated at the end of the excerpt of the rejection of claim 10 reproduced above. Thus, the Office cited Glover for this teaching. For convenience, the portion of the rejection of claim 10 that cites Glover is reproduced below:

Glover teaches a method of determining that the particular entity is present within a horizontally linked list linking at least a subset of the plurality of entities in at least in a descending rank order direction, the subset including the particular entity (col. 49 line 59 –col. 50 line 13),

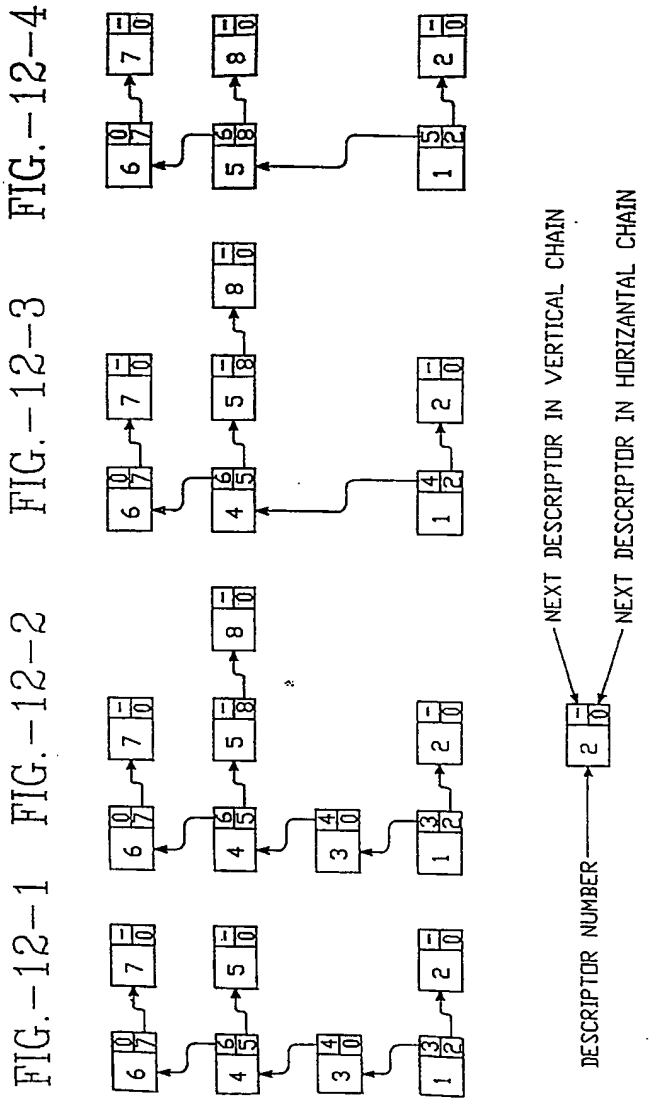
delinking the particular entity from the horizontally linked list and delinking the particular entity from the vertically linked list (col. 50 lines 62-67).

Thus, the Final Action cites Glover's column 49, line 59 through column 50, line 13. This portion of Glover is reproduced below for convenience:

"Referring to FIG. 12-1 each of the rectangles represensts [sic] a descriptor, X, and includes two pointers, a vertical pointer, v, and a horizontal pointer, h. Additionally, each descriptor includes other control information asscociated [sic] with a packet including for example, a length field, l, indicating the number of bits (or cells) in the packet. In the packet descriptor, X indicates the identity of the particular packet being processed by the queue of FIG. 10. For each descriptor, X, an associated rate queue pointer, v, identifies the next-in-order descriptor in the rate queue (vertical chain) that forms a linked list of packets having the same transmission rate. In FIG. 12-1, Descriptor6 (X=6) is at the tail of the rate queue since the next-in-order vertical packet is Descriptor0, that is v=0 for Descriptor6. Descriptorl is at the head of the linked list. Descriptorl has a vertical pointer 3 pointing to the next-in-order packet 3. Descriptor3 has a pointer 4 (v=4) which points to Descriptor4. Descriptor4 has a pointer 6 which points to

the tail of the queue Descriptor6. The rate queue in the vertical direction includes Descriptor1, Descriptor3, Descriptor4 and Descriptor6."

Glover's Figures 12-1 through 12-4 are reproduced here for convenience:



This portion of Glover was discussed in detail above in connection with claim 1 in the Group I set of claims. In summary, the data structure shown in Glover's Figures 12-1 through 12-4 and described in Glover's columns 6, 49, and 50 includes a plurality of nodes. Each node includes a respective descriptor. For example, Figure 12-1 shows a set of nodes having descriptors that range from 1-7. The Applicant notes that within each one of Glover's Figures 12-1 through 12-4, each descriptor is unique and identifies each node uniquely. Generalizing from Glover's Figures 12-1 through 12-4, Glover appears to assign a unique descriptor to each of the nodes in its data structure.

Glover's Figures 12-1 through 12-4 also include what appear to be two sets of pointers. A first set of pointers points to a first "next node", and a second set of pointers points to a second "next node". Logically, this pointer structure would appear to assume that each node is assigned a unique descriptor number. Further, each of Glover's pointers points to at most one other node, or points to null.

In contrast to the foregoing as taught by Glover, the Applicant's claim 10 recites "in response to determining that the particular entity is present within a vertically linked list linking in at least one direction a corresponding subset of the plurality of entities having an identical rank". No two or more nodes as described in the column 49-50 portion of Glover cited in the Final Action, or as illustrated in Glover's Figures 12-1 through 12-4, have identical descriptors. Therefore, Glover

does not disclose nodes having "identical rank", as recited in the Applicant's claim 1.

Turning to Glover's pointer structure as shown in Glover's Figures 12-1 through 12-4, while some nodes in Glover's data structure may be associated with multiple pointers, these pointers do not establish an "identical rank" for any two or more nodes. For example, turning to Figure 12-1, node "4" is pointed-to by node "3", and node "4" points to nodes "5" and "6". Glover's pointer structure does not establish that any two or more of these nodes have identical rank. To the extent that node "4" has "rank", it occupies a single rank "below" node "3" and above nodes "5" and "6". However, Glover's pointer structure does not assign an "identical rank" to any plurality of nodes shown in Glover's Figures 12-1 through 12-4.

On at least this basis, Glover does not teach or disclose a "plurality of entities having an identical rank", and thus does not provide the teaching missing from Nolan to support a § 103 rejection of claim 10, and all claims depending therefrom. On at least this basis, the Applicants request the reconsideration and withdrawal of the § 103 rejections of claims 10-18.

For at least the foregoing reasons, the rejections of claim 10, and all claims depending therefrom, fail to state a *prima facie* case of obviousness under § 103. Similarly, Nolan and Glover fail to support a § 103 rejection of claims 10-18

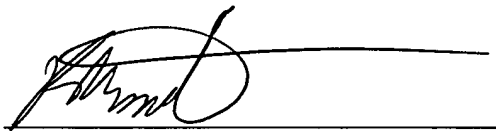
because they do not teach or suggest every limitation recited in independent claim 10, as required by MPEP § 2142. On at least this basis, Applicant requests reconsideration and withdrawal of the § 103 rejections of claims 10-18.

Conclusion

For at least the foregoing reasons, the rejections of claims 1-22 fail to state a *prima facie* case of obviousness under § 103, because Nolan and Glover fail to teach or suggest each feature recited in the rejected claims, as required by MPEP § 2142. Applicant thus requests reconsideration and withdrawal of the § 103 rejections of all pending claims 1-22 at the earliest convenience of the Office.

Respectfully Submitted,

Dated: 12 MAY 05

By: 

Rocco L. Adornato
Reg. No. 40,480
(509) 324-9256; x257

Appendix

Claims 1-22 as now pending are reproduced here. These claims have not been amended since their original filing.

1. (Original) A machine-readable medium having a data structure stored thereon for efficiently ordering a plurality of entities, each entity having a rank within a plurality of ranks, the data structure comprising:

a horizontally linked list linking at least a subset of the plurality of entities in at least a descending rank order direction, each entity in the horizontally linked list having a unique rank as compared to the ranks of other entities in the horizontally linked list; and,

an array having a plurality of array entries over which the plurality of ranks are distributed such that each array entry has a corresponding range of ranks, at least one array entry each pointing to an entity of the plurality of entities having a greatest rank within the corresponding range of ranks for the array entry.

2. (Original) The medium of claim 1, the data structure further comprising at least one vertically linked list, each vertically linked list linking in at least one direction a corresponding subset of the plurality of entities having an identical rank.

3. (Original) The medium of claim 2, wherein each vertically linked list links the corresponding subset of the plurality of entities in a first vertical direction and a second vertical direction.

4. (Original) The medium of claim 1, the data structure further comprising a head pointer pointing to an entity having a greatest rank of the plurality of ranks of the plurality of entities.

5. (Original) The medium of claim 1, wherein the horizontally linked list further links at least the subset of the plurality of entities in an ascending rank order direction.

6. (Original) The medium of claim 1, wherein the plurality of ranks are equally distributed over the plurality of array entries.

7. (Original) The medium of claim 1, wherein the entity having the greatest rank within the corresponding range of ranks for each of one or more of the at least one array entry is one of a subset of the plurality of entities having the greatest rank within the corresponding range of ranks for the array entry.

8. (Original) The medium of claim 1, wherein at least one array entry of the plurality of array entries each points to null, corresponding to no entity within the plurality of entities having a rank within the corresponding range of ranks for the array entry.

9. (Original) The medium of claim 1, wherein each entity of the plurality of entities is a thread, the rank of the entity is a priority for the thread, and the array is a priority queue.

10. (Original) A method for removing a particular entity from a plurality of entities, each entity having a rank within a plurality of ranks, the method comprising:

in response to determining that the particular entity is present within a vertically linked list linking in at least one direction a corresponding subset of the plurality of entities having an identical rank, the corresponding subset including the particular entity, delinking the particular entity from the vertically linked list;

in response to determining that the particular entity is present within a horizontally linked list linking at least a subset of the plurality of entities in at least in a descending rank order direction, the subset including the particular entity, delinking the particular entity from the horizontally linked list; and,

in response to determining that an array entry of a plurality of array entries of an array over which the plurality of ranks are distributed points to the particular entity, adjusting the array entry to point to one of null and another one of the plurality of entities.

11. (Original) The method of claim 10, wherein the array entry has a corresponding range of ranks, and adjusting the array entry to point to one of null and another one of the plurality of entities comprises, in response to determining that the particular entity was present within the vertically linked list, adjusting the array entry to point to a next entity within the vertically linked list.

12. (Original) The method of claim 11, wherein adjusting the array entry to point to one of null and another one of the plurality of entries further comprises, otherwise, in response to determining that the particular entity was present within the horizontally linked list, and that the rank of a next entity within the horizontally linked list is within the corresponding range of ranks for the array entry, adjusting the array entry to point to the next entity within the horizontally linked list.

13. (Original) The method of claim 12, wherein adjusting the array entry to point to one of null and another one of the plurality of entries further comprises, otherwise, adjusting the array entry to point to null.

14. (Original) The method of claim 10, further comprising, in response to determining that a head pointer pointing to an entity having a greatest rank of the plurality of ranks of the plurality of entities points to the particular entity, adjusting the head pointer to point to another one of the plurality of entities.

15. (Original) The method of claim 14, wherein adjusting the head pointer to point to another one of the plurality of entities comprises, in response to determining that the particular entity was present within the vertically linked list, adjusting the head pointer to point to a next entity with the vertically linked list.

16. (Original) The method of claim 15, wherein adjusting the head pointer to point to another one of the plurality of entities comprises, otherwise, in response to determining that the particular entity was present within the horizontally linked list, adjusting the head pointer to point to a next entity within the horizontally linked list.

17. (Original) The method of claim 10, wherein each entity of the plurality of entities is a thread, the rank of the entity is a priority for the thread, and the array is a priority queue.

18. (Original) The method of claim 10, wherein the method is performed by execution of a computer program stored on a machine-readable medium by a processor.

19. (Original) A method for adding a new entity having a rank within a plurality of ranks to a plurality of entities also each having a rank within the plurality of ranks, the method comprising:

of a plurality of array entries of an array over which the plurality of ranks are distributed such that each array entry has a corresponding range of ranks, determining the array entry having the corresponding range of ranks in which the rank of the new entity lies;

adjusting the array entry having the corresponding range of ranks into which the rank of the new entity lies to point to the new entity in response to determining that the array entry currently points to null;

adjusting the array entry having the corresponding range of ranks into which the rank of the new entity lies to point to the new entity in response to determining that the array entry current points to an entity having a rank less than the rank of the new entity;

linking the new entity into a vertically linked list linking in at least one direction a corresponding subset of the plurality of entities having an identical rank, in response to determining that the rank of the new entity is equal to the rank of any other entity within the plurality of entities; and,

otherwise, linking the new entity into a horizontally linked list linking at least a subset of the plurality of entities in at least a descending rank order direction, each entity in the horizontally linked list having a unique rank as compared to the ranks of other entities in the horizontally linked list.

20. (Original) The method of claim 19, further comprising adjusting a head pointer pointing to an entity having a greatest rank of the plurality of ranks of the plurality of entities to point to the new entity in response to determining that the rank of the new entity is greater than the rank of the entity of the plurality of entities to which the head pointer currently points.

21. (Original) The method of claim 19, wherein each entity of the plurality of entities is a thread, the rank of the entity is a priority for the thread, and the array is a priority queue.

22. (Original) The method of claim 19, wherein the method is performed by execution of a computer program stored on a machine-readable medium by a processor.